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COMPUTER DATA PROCESSING (SELECTED ARTICLES).(U)  
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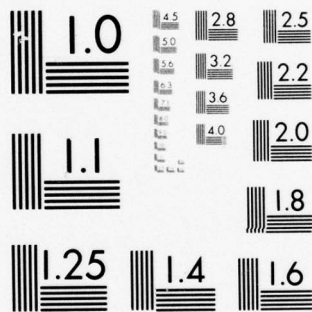
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FOREIGN TECHNOLOGY DIVISION



COMPUTER DATA PROCESSING  
(SELECTED ARTICLES)



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VVB MASCHINELLES RECHNEN - THE LARGEST ELECTRONIC DATA  
PROCESSING USER IN THE GDR

Klaus Schwedler

According to the central decisions on the use of data processing the VVB MR is obliged to utilize its facilities for carrying out socialistic rationalization primarily in the following areas:

- the State Central Administration for Statistics for safeguarding the state information system for accounting and statistics,
- for the local state authorities and the businesses and installations subordinate to them, and
- for businesses and installations from all branches of the national economy of the GDR which have no, or insufficient, electronic data processing facilities of their own.

The work of the State Central Administration for Statistics is carried out primarily in a specialized computer center. The studies for the local state authorities and for all businesses and installations are carried out on the basis of long-term agreements and arrangements with the authorized central agencies in the district data processing offices of the VVB Maschinelles Rechnen. The areas of concentration and the organization of the collaboration, the problems to be solved by each partner, and the principles for the constant matching of needs and production are established in these agreements. Long-term economic

agreements between the subordinate businesses and installations are concluded on this basis. Most branches use both the facilities of the VEB MR and their own. Some branches successfully completely rely on the VVB MR, for example the local state authorities, the hydroeconomy, the forestry VVB, and the "agro-technical" industry. Businesses and installations from all branches of industry and all other areas of the national economy are clients of the VEB MR. VEB MR has 100 to 300 different customers, of which around 90 percent have worked together with VEB MR for a long time and around 10 percent are occasional customers, primarily those who prepare the input of their own computers or who can not cover their needs with their own facilities.

As a contribution to the chief task determined at the VIII Party Congress the VVB MR works out appropriate economization solutions for its customers, primarily for increasing the efficiency and productivity of material processes. The VVB MR constantly strives to achieve a high level of economic utilization through the creation of adequate scientific and technical leads, by the continuous perfection of methods and processes in use, and by the developemnt of new areas of application.

#### RESULTS OF THE WORK OF THE VVB MR

In the 25th year after the foundation of the German Demo-

cratic Republic the employees of the VVB MR can look at the results obtained with considerable pride.

The VEB MR was among the first computer centers which were able to convert to general use of the R-300 unit. On the average for all units in use, a monthly productive operating time of 590 hours has been obtained so far this year.

Table 1. The R-300 Productive Operating Time in the VVB MR averaged per Unit and Month

1968	1969	1970	1971	1972	1973
245	323	364	397	459	546

The result of putting into effect the well-known adage "the highest efficiency of utilization of each mark, each hour of working time, and each gram of material" made it possible to lower the hourly cost of the R-300 to 370 marks in 1974 as compared with the maximum cost of 450 marks.

In accordance with the decision of the Cabinet Council of the GDR on the main areas of utilization of electronic data processing in the course of the 1971-1975 Five Year Plan made on 1 March 1972, the VVB MR has concentrated its facilities on the focal points established there.

Therefore, areas of application of electronic data processing which directly contribute to the welfare of the people are



of primary importance as a contribution to the realization of the main goals formulated at the VIII Party Congress of the United Socialist Party of Germany.

Table 2. Portion of VVB MR Facilities Used in 1973 According to Areas of Concentration

	SEW <sup>1)</sup>	MEW <sup>2)</sup>	Number of proj.
Increasing production	15%	10%	290
Raising the efficiency of control and planning	27%	29%	570
More economical organization of routine processes	42%	50%	950
Achievement of a higher effectiveness of the creative work	16%	11%	290

1) SEW - scientific engineering work

2) MEW - machine engineering work (preparation work)

Thus in 1973 28.7 percent of the scientific engineering work and 36.6 percent of the machine capacities of the VVB MR were able to be used for these projects.

The efforts and resources of the VVB MR are increasingly concentrated on such areas of application of data processing in which a high increase of production, a discernable saving in company working energy and administrative expense, and a drop in the material use per product can be obtained, and the mass initiative of the workers in socialistic competition, in-

cluding innovative activity, is greatly encouraged.

The 50 projects which led to the best results for our clients produced a total profit of around 80 million marks per year and a saving of 623 jobs.

Thus it was possible to achieve a profit of 600,000 marks and a saving of 30 full employment units with the "Planning, Accounting, Stock DataFiling, Optimization, Materials Calculation, Accounting, Financing" (PASOMAF) project developed by the Halle VEB MR for the Candy and Bakery Products VVB. The "PASOMAF" project was made to be reusable. Certain parts of the project are used by several businesses in addition to the Candy and Bakery Products VVB. The introduction of the "Spare Part Supply, Industrial Distribution RFT" program worked out by the Leipzig VEB MR produces a profit of around 3.0 million marks. A profit of 160,000 marks is shown for a materials project of the Cottbus VEB MR (client: Institute for the Refactory Industry). The "Forest Funds" project which was developed by the Berlin VEB MR DVZ for the Potsdam Forestry Planning VEB yielded a total profit of around 25 million marks.

The project "Formulation and Calculation of Food Plans of General Provisioning Establishments" contributed a profit of 100,000 marks (Central Institute for Nutrition, Potsdam-Rehbrücke, VEB MR Potsdam), the project "Early Recognition of



Cervical Carcinome" contributed a profit of 150,000 marks (Rostock-Südstadt Regional Hospital/ VEB MR Rostock), and the project "Beef Cattle Purchasing" contributed a profit of 500,000 marks and a saving of 50 full employment units (State Committee for the Purchasing and Processing of Agricultural Products/ VEB MR Neubrandenburg) for improving working and living conditions.



The Berlin VEB Maschinelles Rechnen Building is One of the Numerous Newly Built Data Processing Centers in the District Cities. Photo: Karin Kaiser

The computer evaluation of the results of the 1971 European

Shooting Championships in Suhl may be mentioned as a further prominent example of the use of data processing. The error-free, prompt presentation of results left the comparable evaluation of the World Championships in Phoenix, USA, far in the shade.

A prominent example of the utilization of the national technology (use of projection screens, remote data processing) was offered by the use of electronic data processing in the national elections in 1970/72 and 1974.

The VVB MR has taken care to avoid reduplication of work and to pay great attention to the reuse of programs. Although there are still considerable problems in this area, good progress has been made in recent years. It was possible to use standardized programs in whole areas of the economy, especially in the areas where the managing authorities and the project coordinating offices became involved, for example in the land, forestry, and food merchandising industries, in the hydroeconomy, in the branches of the production equipment trade, and in the local state authorities. An example is the standardized "Foreign Trade/Tourism" program of the Federal Board of the Free Federation of German Trade Unions. It was developed as a pilot project by the VEB Control Center for Application Research of the VVB MR. The use of the bed reservation system by 10 clients has already yielded a profit of 180,000 marks. A total of 35 cases of application are predicted. A service

and cost accounting system is in preparation.

Through the establishment of its own project coordinating office, the specialization of VEB MR to client and field oriented operations, and the development of pilot projects, the VVB MR has supported this process.

The following are some of the pilot projects:

- accounting for small and medium-sized businesses,
- medium-term production planning for small and large businesses (MiPP),
- quasilinear, multiple regression,
- R 300 and R 21 table generators,
- R 21 macroelement system,
- cost and service accounting for operations of the ÖVW.

The operations of the VVB MR have made a considerable contribution with the development of machine-oriented data systems for the R 300 in order to increase the efficient utilization of this unit. This process is intended for the ESER. A large number of problems was solved in the preparation of the ESER input, but it came down to a question of ensuring fast efficiency of the units with a maximum of uniformity. The necessary methodical-organizational process was developed including, for example, a standard generating instruction for the DOS/ES operating system, a standard documentation for the computer center,

and an assembler and PL/1 technique. These materials also were of great interest for the VVB MR.

The training work was carried out primarily through the Advanced Training Academy of the VVB MR. Since 1970 over 4000 employees, especially organizers, programmers, professional training workers, and managers have taken the courses. Clients also were invited to the advanced training, a practice which will be carried out more extensively in the future.

Mindful of its responsibility to carry out its primary task, ordered in 1967/68, as a specialist in data processing, the VVB MR has sought not only constant agreement of the teaching plans for specialist training with the requirements of the electronic data processing customers but also has contributed to the establishment of the prerequisites for the training of several thousand specialists up to now through the establishment of professional schools for data processing and other training facilities. With the territorial concentration of vocational training at these professional schools which has begun, further work also is being carried out vigorously in this area.

The VVB MR has provided a significant contribution as a collaborator of the VEB Kombinat Robotron in the completion of SOPS, VOPP, and VOPS. There is also close collaboration with the Kombinat Robotron in the development of machine orientated



data systems, particularly for remote data processing and data banks.

#### THE FURTHER DEVELOPMENT OF VVB MASCHINELLES RECHNEN

We believe that the further development of the VVB MR should be in the direction of shaping the regional computer installations into efficient regional collective data processing centers which will be found in each district in addition to computer centers belonging to specific businesses and computer centers of special branches of industry. The technical base of the VVB MR is to be developed so that it provides a wide range of efficient and available electronic data processing, ESER computers being used exclusively. The keypoint, therefore, is large electronic data processing units which form the decisive material and technical basis both for the increasing demands of state information and planning and also for the use of remote data processing and the formation of data banks corresponding to the requirements of the central and regional administration and planning. Only large electronic data processing units make it possible to realize the collective utilization of concentrated data processing capacity with the greatest economic effect. Collective utilization can ensure connection with the clients by means of remote data processing (data acquisition points, data terminals, interrogation units for dialogue operation) and connection with process computers used by the clients.

In the further development the collective data processing centers are to be coupled together into an interconnected system. The direct incorporation of important customer fields into the interconnected system is ensured with this coupling, and the possibilities of access on short notice are significantly expanded.

With the increase in data processing facilities it is necessary to make more economical and to further develop the expensive process of obtaining a data carrier, especially with the use of magnetic tape acquisition units, document readers, and microfilm input. The growing scope of data acquisition can be mastered only with the use of these processes in the regional data processing centers and with the expansion of the data acquisition facilities of the customers. Only a small increase in the labor force required is expected from the development of the technical facilities of the VVB MR for data acquisition.

The scientific and technical policy of the VVB MR results from the basic direction of the further development of the use of data processing in the GDR, in particular from the joint work carried out with the USSR.

Application research plays a decisive role in the creation of an adequate pilot project in the use of data processing. The areas of concentration in application research are derived from the projected organization of collective regional data pro-



cessing operations:

1. increasing the cooperation with the Soviet Union, utilizing the Soviet experience with the use of ASU;

2. opening new methods of solution and areas of application of electronic data processing, taking account of such aspects as:

- greater development of the system aspect in evaluating Soviet experience,
- greater use of economic and mathematical methods and processes,
- the establishment of new forms of communication between man and machine,
- the creation of collective computer systems based on remote data processing,
- the development and establishment of data banks;

3. establishing preconditions which ensure the effective use of new technology (ESER);

4. creating models which reflect the scientifically and technically highest level of the use of electronic data processing in the GDR.

From the available results of application research and need research it can be deduced that standardized planning and programming has to be developed particularly because economization solutions for the clients must be created through the processes established by electronic data processing. Because of the very short introduction time involved, projects of this kind have a

low initial cost.

The predicted development of the VVB MR is based on analyses of the qualitative and quantitative development of the needs of our customers. According to our information it offers the assurance that these needs will be met economically.

We have great confidence of realizing this ambitious long-term goal since we have made great progress under the direction of the party and government since the time of our founding.

The VEB Maschinelles Rechnen was formed in 1957 from the statistical and technical departments of the State Central Administration for Statistics. The basic idea was to make the available punch card technology, as well as statistics, usable for plants and businesses for making their operations more economical and to stimulate a high rate of utilization of punch card techniques through economical accounting practices.

How did this newly formed operation look?

29 antiquated tabulating machines, 612 workers, 9 branch offices in Berlin, Schwerin, Potsdam, Magdeburg, Halle, Erfurt, Dresden, Leipzig, and Karl-Marx-Stadt. In 1959 a branch office was opened in each regional capital, the first tabulating machines from the **Schmerda Office Machine Factory VEB** came into

use, and the ASM 18 and R 100 electronic punch card calculators followed in the beginning of the 60's.

The scope of punch card technology was considerably expanded in the following years; in 1966 131 tabulating machines and 7 Gamma 10 small electronic computers were present in the branch offices of the VEB Maschinelles Rechnen. The machines were used to complete capacity on two shifts and had a monthly operating time of 310 hours.



The first Robotron 21 electronic data processing unit in the purview of the VVB was delivered to the VEB Maschinelles Rechnen in August 1973.

The range of application of punch card technology was already considerable; more than 1000 plants and businesses in our

national economy were working with VEB Maschinelles Rechnen.



The Free German Youth and young people of the Dresden Robotron-Electronics VEB wanted to achieve the "Q" rating for the EC 2640 central unit on the 25th birthday of the GDR. (See also the article on p. 3 of this issue). Our picture shows the testing of the EC 2640 central unit.

A considerable effect on the national economy had already been achieved at that time in spite of the still low degree of mechanization. Keeping account of the goods received and goods sold for the textile, dry goods, and household items wholesale business and keeping account of fuel credit slips for the Minol VEB were among the greatest tasks carried out for the entire republic. The VVB Maschinelles Rechnen was formed on 1 January 1966 and



the branch offices became independent People's Own Undertakings (VEB's).

The sizes reached by the branch offices, the increasing range of application, and the preparation of the input for electronic data processing units and all the problems connected with it made this step necessary. A comprehensive training program was carried out and the construction of data processing centers for utilizing the new technology was begun in the district cities. In 1968 the first R 300 was put into operation in Suhl in the presence of the candidate for the Politburo of the United Socialist Party of Germany, General Kleiber. Altogether 40 R 300's were installed in the VEB Maschinelles Rechnen in 1972 and around 2500 organizers and programmers were hard at work for the wide range of customers of the VVB Maschinelles Rechnen.

In 1970, while the installation of the R 300's was under way, preparation began for the <sup>installation</sup> ~~new~~ of the third generation, which was carried out in 1973/74 with the installation of ROBOTRON 21 and is continuing with ES 1020 at the present time.

We believe that the economically most favorable means of carrying out socialistic economization and perfection of management and planning in data processing involves a great concentration of scientific engineering and machine engineering facilities.

An evaluation of Soviet experience shows that the best way to carry out socialistic economization in the area of electronic data processing lies in the development of regional data processing centers for collective use. Only the process of concentrating the currently ~~dis~~united data processing and scientific engineering facilities in this way leads to an increase in the efficiency of the working capacity through rising production with a simultaneous cost reduction, saving of manpower and capital, and an increase in the output.

An excellent example of this was given by the building of the Magdeburg DVZ at the initiative of the district office of the party and of the Council of Magdeburg District. The unification of the electronic data processing facilities of the Magdeburg VEB MR with those of industry resulted as a first step.

The correctness of this process is confirmed by the manpower and capital savings already demonstrated. As a logical consequence the incorporation of further regional users is being investigated and readied.

We will use all of our resources in coordination with the district offices of the Party and the District Councils in order to generalize the experience from Magdeburg to all districts in a meaningful way, as was directed by the Presidium of the Council of Ministers.



Furthermore, the VVB MR will faithfully carry out the orders given it by the Party and the government and thus will make its contribution to the further development of socialistic society.

# THE DEVELOPMENT OF THE USE OF ELECTRONIC DATA PROCESSING IN THE BERLIN "7TH OF OCTOBER" MACHINE TOOL COMBINE VEB

H. Ostrowski and B. Kaufmann

## 1. DEVELOPMENT OF ELECTRONIC DATA PROCESSING APPLICATION

The use of electronic data processing has become an integral component of management and planning activity in the Berlin "7th of October" Machine Tool Kombinat VEB. The complicated processes and the great expenses in the areas of preparation and administration in machine tool construction today can objectively only be managed with the use of electronic data processing. The beginnings of computer solutions to organizational problems go back to the use of punch card machines. The establishments belonging to the combine today had in part punch card facilities which were equipped with data acquisition units, sorting machines, tabulating machines, and other equipment of <sup>very</sup> different types including the ASM 18 and the R 100. The establishments without punch card facilities operated their punch card operations in cooperation with third parties. The punch card projects dealt primarily with problems of accounting (funds and materials), calculation, expenditure and capacity balances, and planning sheets for production control.

With the development of data processing technology modern units such as the C 8205, R 300, and ES 1040 came to be used. These units were used by the combine to meet the increased calculation requirements of the reproduction process, control, and

and realization. In accordance with the significance of the electronic data processing economization measures, as was shown at the Eighth Party Congress of the United Socialist Party of Germany and in the decision of the Council of Ministers on the basic direction of the development of data processing on 1 March 1972, the installation and utilization of the equipment consequently has been incorporated into the development of the combine and has been orientated toward management and planning, as well as toward reducing routine operations.

The following computers were used in the organization and computation centers of the "7th of October" Combine:

- an R 300 each in Berlin (1969), Karl-Marx-Stadt (1970), magdeburg (1970), and Leipzig (1971),
- a C 8205 each in Dresden (1971) and Berlin (1972), and
- an ES 1040 in Berlin (1974).

The role of the punch card facilities has been reduced gradually because of the use of this equipment. The large punch card machines will be eliminated by 1975 because of their physical wear and the punch card projects will be discontinued.

## 2. REGIONAL COMPUTER CENTERS OF THE COMBINE / COMPUTER NETWORK

The basic idea in building the organization and computation centers was the regional principle.

The machine-constructing operations of the combine are concentrated in Berlin, Karl-Marx-Stadt, Leipzig, and Magdeburg. In each of these cities an R 300 was installed in one of the plants of the combine there for shared use by plants in the combine located in the region. No centralization of the entire computer equipment of the combine in one region and one organization and computation center was ever attempted because it represents no real solution technically and economically because of the territorial spread of the combine. The regional organization and computation centers perform not only the computation work for all operations of the combine in a region, but also undertake the planning for all operations in the region. The use of the R 300 provided security that the projects used for the machine construction operations of the combine were set up (at least regionally) fundamentally on a standardized basis and are only adapted to the peculiarities of each case of application.

Three goals were aimed at, and achieved on a wide scale, with the regional principle:

- optimum use of the material and financial investments,
- optimum use of the planning facilities by means of uniform planning and reusable projects, and
- maximum utilization of the electronic data processing equipment with minimization of the financial, material, and labor expenses.



The regional principle of computer operations in the "7th of October" Machine Tool Combine VEB of Berlin will also be maintained in the future. All computer centers will be converted to ESER computers during the 1979-1981 period according to the physical and moral wear of the R 300 units.

With the installation of the ES 1040 units in the Berlin "7th of October" Combine the computer centers of the combine were united into a computer network. The central computer of the combine is the ES 1040 which performs work for the management of the combine and the Berlin operations of the combine. The other computer centers are linked with the central computer center of the combine through remote data transmission using the DFE 550 remote data transmission unit. Data for short-cycle problems of combine management are transmitted in this way and consolidated and evaluated in the central computer center of the combine. Data for long-cycle problems of combine management (e. g. medium-range and yearly planning) in the form of magnetic tapes or punch cards from the regional computer centers are delivered, read, and processed at the central computer center.

Remote data transmission between the installations on a cooperative basis and within the installations for data transmission from territorially separated installations to the computer center of the appropriate main installation is also used

in the same way. The simple principle of the interlocking of the computer centers of the combine into a computer network has already been proven good. Significantly even greater possibilities for the integration of data processing techniques in the combine surely will present themselves within the framework of the ESER on the basis of new technology. The current approach using the DFE 550 is seen as an adequate technical solution for the problems of the years in the immediate future.

### 3. AREAS OF APPLICATION OF SMALL COMPUTER PROJECTS

Depending of the specifics of the reproduction process on the one hand, and the technical potentialities of the unit on the other, the following projects for the C 8205 small computer were developed for an abrasive wheel factory:

#### PRODUCTION PLAN FULFILLMENT

The project includes the daily and cumulative accounting of the material production according to amount and value with a special statement of the exports. Tables which provide the management (especially the production management) with the necessary information on daily plan fulfillment as an actual plan broken down comparison and according to cost accounts and cost carriers are constructed on the basis of piece and deadline cards.



## WAGE ACCOUNTING

This project deals with calculating the gross, net, and production wages broken down according to cost accounts and cost carriers. The average wage per worker and the department totals also are shown. The organizational solution of the project stipulates a continuous processing and intermediate storage of the data accumulating during the course of the month so that extreme load peaks are avoided in the accounting periods.

## COMPUTER DISCOVERY OF THE COST ACCOUNTING CURVES

The cost accounting curves (CAC I and CAC II) are determined and consolidated by computer for the monthly, quarterly, and cumulative accounting of the operating costs (according to type of cost, cost account, and cost carrier). The print-outs provide information on consumption of materials, wages, salaries, individual technological costs, and production costs. This significantly reduces the manual labor in cost accounting and provides management with an instrument for meaningful control and supervision of costs.

In addition to these areas of concentration the unit is used for

- calculating the individual operational performance,
- carrying out the computational and material inventory,

- counting up and evaluating the initial calculations of funds, lands, and foreign currencies.

The following projects are worked out on the C 8205 within the framework of the foreign trade activity for the machine tool combines:

- writing out export contracts for the socialistic economic region and issuing punch tapes for writing contracts on organizational automatic equipment,

- calculating interest on arrears including printing out the necessary requests for payment,

- conversion of foreign currency into marks, calculation and checking of import accounts,

- checking export calculations for accuracy, yearly operational planning,

- printing out price lists with sale prices of all types of machines in the national currencies on the basis of a continuous change service with respect to changes in exchange rates.

#### 4. AREAS OF APPLICATION OF THE R-300 PROJECTS

The preparation for the application of the R 300 electronic data processing unit began in individual establishments even before the formation of the combine and led to two different project concepts. As will be shown later, this circumstance can be avoided in the case of the installation of the ESER units. The project concept in <sup>the</sup> Karl-Marx-Stadt territory is primarily oriented toward auditing and deals with the areas of technical

preparation, material economy, and production planning proportionally less. On the other hand, the R 300 projects in the remaining three organizational and computational centers of the combine are concentrated primarily on the areas of

- technical preparation,
- medium-range production planning,
- operative planning and direction of production, and
- material economy.

The computer solutions for problems of auditing in this organizational and computational center are carried out primarily on punch card machines and will not be solved on the R 300 or with ESER projects until 1975/76.

The program solutions realized by computer in the above-mentioned areas are in the following areas:

#### TECHNICAL PREPARATION

The project records and supervises technical (especially technological) data from the production schedules and parts lists on magnetic tapes as a data base for materials management and production planning. It permits preliminary calculation of components for materials and wages as well as analysis of the plan of socialistic economization.

## MATERIALS ECONOMY

This project deals with

- determining the materials needs per series for materials planning and supply, broken down as to time and type,
- the computer planning (preliminary quotation, determining the movements of materials with improvements in the stock, forecasting the development of the stock),
- contract and delivery supervision, and
- a statistical determination of standards for individual ELN items from past values and recalculation of the consumption of materials for a production value of 100,000 marks based on a master catalogue of materials listing articles individually and recorded on magnetic tape.

## MEDIUM-RANGE PRODUCTION PLANNING

This project is used to find and lay out plan variants in order to help management make decisions and to provide a basis for planning discussions. The project is divided into the following parts according to content and programming techniques:

- preparation of the data on working time expenditures from the technological working plans and consolidation into balance groups and time units,
- parametric and linear optimization for determining the optimum production program,
- rough break-down of the production program, and



- fine balancing of the required working time with the working time available.

## OPERATIVE PLANNING AND DIRECTION OF PRODUCTION

The project encompasses

- breaking down the production into individual orders according to the annual plan,
- supervising the production orders,
- determining the finished operations (by schedule), and
- making different evaluations, for example of operative capacity balances, schedule progress controls, production progress controls, and wage data.

## 5. USE OF ESER TECHNOLOGY

### 5.1. USE OF THE ES 1040 AND THE COMPUTER NETWORK OF THE COMBINE

Since 15 January 1974 an ES 1040 ESER computer has been working on the usual four-shift basis in the "7th of October" Combine of Berlin. The configuration used is a clear example of socialistic economic integration. The central unit with 512 K-byte main memory capacity, parallel printer, and magnetic tape equipment was manufactured in the GDR by the Robotron, Zentronik, and Carl Zeiss, Jena, combines. Added to this are punch card readers and card punchers from the USSR, alternating plate me-

mory from the Bulgarian PR, and a punch tape station from the Polish PR. A unit for converting from R 300 magnetic tapes to ESER tapes completes the setup.

Testing the interaction of equipment technology, operating system, and problem-orientated system data of the Robotron VEB combine under industrial conditions was the joint task of the Robotron and Berlin "7th of October" combines.

Valuable information on the servicing of these large units, on the availability of the individual units, and on the further development of the equipment technology and system data can be obtained in these investigations. At this point we shall not go into details about the size of the equipment, the organization of the computer operation, multiprogram operation, qualification of the staff, and servicing. They are beyond the scope of this article.

## 5.2. PLANNING CONCEPTS FOR THE INTRODUCTION OF ESER TECHNOLOGY IN THE COMBINE

The following goals were established for planning within the framework of preparation for ESER introduction in the Berlin "7th of October" VEB:

1. The project concept is a component of the complex socialistic economization and is reckoned according to economic

criteria.

2. The quality of the solutions as to contents is to be increased appreciably as compared with the R 300 solutions by improving the integration between the individual topic complexes and the utilization of all possibilities of the new computer technology.

3. According to the state directives, the following subject areas are to be emphasized:

- production control as a means of intensifying production,
- freeing the technical preparation for production from routine projects and creating qualitatively new, optimum solutions in technical preparation, and
- improved decision aids for the management of the combine, particularly with respect to planning, through the introduction of economical-mathematical models.

4. The conformability of the organization of on-going R 300 projects and new ESER projects must be ensured.

5. Problem-oriented system data (POS), especially SOPS and VOPS from the Robotron Combine VEB, are to be used most extensively.

6. The project is to guarantee a rapidly effective initial stage with developmental capacity for 10 - 15 years.

The project concept consists of two parts. One part encompasses projects for the control, planning, and accounting of the reproduction process on the level of the combine (REPROKO) and the other part encompasses projects for the control, planning, and accounting on the level of one operation of the combine (REPROBE).

Both parts in each case encompass several complexes and are closely interconnected.

The REPROKO part consists of the auditing and combine-level planning complexes.

The auditing complex encompasses the following processes: recording the planning events in the operations of the combine on punch tape, remote data transmission to the ES 1040, input of these data, consolidation, consolidation, computations, comparison with the planning values of all operations recorded on the ES 1040, and printing out comprehensive information for the combine management.

Calculations as an aid in analysis also are included for a part of these characteristics.

The combine-level planning complex includes three sub-complexes. Two subcomplexes serve for consolidation of charac-



teristics of the quarterly financial plan or of the yearly plan on the combine level. The conclusive advantage of these two subcomplexes, as in the case of accounting on the combine level, lies in the freeing of the appropriate subject areas from routine operations and quick preparation of results for the combine management.

The third subcomplex serves for optimization of the production plan on the combine level with the use of the VOPS OPSI.

An optimum production plan estimate for the entire combine, and thus for all operations of the combine, is calculated on the basis of the state figures. All interactions in the combine which result from the **output** of machine systems and production lines, **centralized production of parts**, and cooperation within the combine are considered here. Marketing limits, working time expenditures, and materials expenditures for all products, funds of all operations, and economic figures, also enter into the model. Partial figures and a corresponding production plan estimate with rough balances for all operations **are** determined in the result. These **figures** and this production plan estimate are recommended to the individual installations. This production plan estimate or other variants are balanced out more exactly in the installations. These exact operational balances are used directly as computer printouts as the basis for the planning discussions in the installations.



The Computer Center of the "7th of October" Machine Tool Combine VEB with the ES 1040 Computer.

The usual course of production planning in the combine therefore goes from the combine management to the foremen of the individual installations.

With respect to data processing, the project is based on the following process: the production planning in the combine management and in the installations is performed with the same data with different emphasis being put on the data. These data are used in the different installations for technical preparation with the R 300 projects at the present time, and will be used with the ESER projects in the future. At the moment of planning for the entire combine on the ES 1040 these data are recorded on magnetic tapes in the regional computer centers and read into the ES 1040. A corresponding set of programs next is used for classification in the data bank for production planning

on the combine level and for the preparation of output data for the VOPS OPSI.

This project shows how ever more complex problems can and must be solved by data processing in order to master the constantly increasing demands of the management of the reproduction process.

This development consequently<sup>is</sup> guided by the knowledge and experience which was obtained in the development of ASU in the USSR.

The REPROB<sup>part</sup> for control, planning, and accounting on the installation level encompasses 5 complexes which are mentioned only briefly here:

- technical preparation with
  - \* management of the primary technical data by means of SOPS BASTEI
  - \* machine programming of NC machines
  - \* computer-based production of primary working plan cards for specific subgroups
  - \* catalogue construction
  - \* technical calculations;
- medium-range planning with production plan balancing for the medium-range and yearly periods and contributions to the work force and financial plan;

- production control based on SOPS PLUS with determination of needs, planning of all steps of the process, order formation, balancing with expenditure postponement, load planning, true value determination, and comprehensive progress control;

- materials management based on SOPS MAWI with determination of material requirements, materials planning, materials supply calculation, materials management, computation of orders for materials, and management of availability of materials in integration with SOPS PLUS;

- accounting with wage calculation, materials calculation, and cost calculation.

The following advantages, among other, as compared with the R 300 projects were obtained:

- significantly greater integration,
- preparation of actual data for all processes in planning and accounting,
- faster development of comprehensive processes such as, for example, a complete new determination of material requirements in the case of operative changes in the production planning,
- significantly better quality of the functional solutions, for example in planning the course of the production process, machine assignment, etc.,
- conversion of processes formerly carried out manually to machine treatment.



The aim of this report is not to present the individual solutions since that is not possible because of the scope of the projects. Only three results will be mentioned here.

In accordance with the goal of installing the ES 1040 electronic data processing unit, the Berlin "7th of October" Machine Tool Combine VEB was oriented toward the use of Robotron program-oriented system data. VOPS-OPSI data are used primarily for optimization of production planning on the combine level and SOPS BASTEI, PLUS, and MAWI data are used for the most important part of the project on the plant level. Above all else, the integrated use of SOPS BASTEI, PLUS, and MAWI was not always without problems. In fact, however, the information now available shows that <sup>there are</sup> solutions on the plant level, which represent a new degree of quality with respect to content and organizational process as well as integration and extensibility, with these three SOPS for the crucial areas of technical preparation, production control, and materials management.

The second finding deals with the transition from the R 300 projects to the new projects based on the ES 1040. Experience shows that it is absolutely necessary to plan <sup>adequately</sup> for the great expenditures involved in solving this problem, especially if the R 300 projects are already greatly integrated and include a large part of the operations for the control, planning, and accounting of the reproduction process. This will be demonstrated

with only one example. The primary technological information stored on R 300 main tapes is taken over in forming the BASTEI data banks. A number of qualitatively new data necessary for the improvement of production control and materials management are added to this. The data bank is filled during production and requires larger space depending on the scope of the production program and the technical data in a machine tool construction operation. The SOPS PLUS system for production control, however, can only be ~~operated when~~ integrated with the BASTEI when it is completely filled for all products. So far only the corresponding R 300 project is being used. The original data from the BASTEI data bank for all products which are already recorded in this data bank must now be made available for this project in the transition phase. Two additional program strings for solving the problems of the transition from the R 300 to the ES 1040 are required for the BASTEI data bank.

The third finding concerns the complex use of different means of administration economization in accordance with the Soviet experience. Here also only one example will be mentioned. In the datalogue construction project - a part of the technical preparation complex - electronic data processing is used in conjunction with microfilm techniques. All individual parts and structural components are provided with classification numbers and filmed. As a result, microfilm records are made available to the cataloguers. With the use of the search lists prepared

by the computer in the redesign it can be guaranteed that already existing parts will be reused to an ever greater degree. In order to achieve the greatest effect for the user (in the example of the area of the design), the possibility of coupling electronic data processing solutions with other economization methods, as applied to each individual project, may be verified as early as the beginning of the planning stage.

The complex application of projection screen techniques, more comprehensive solutions for economization and automation in construction and technology, and central projects extending beyond the scope of the combine are the next stage on the way toward ASU. Actual work on some of these projects has already begun, as for example on the balancing of machine tools together with the State Planning Commission, the Ministry for Machine Tool and Fabricating Machine Construction, and all machine tool combines.

The use of the considerable experience of the USSR in direct cooperation to an even greater degree than before is indicated here. Just as the division of labor in the area of production was organized to a constantly increasing degree with the formation of the Berlin "7th of October" Machine Tool Combine VEB, the preparation for the use of electronic data processing in the Berlin "7th of October" MTC VEB also is being carried out in two stages. The first stage includes the planning and

testing of the individual projects. The planning is being performed by a collective organization preparing for the use of the ES 1040 electronic data processing unit and groups from all regional organizational and computational centers of the combine. All projects on the plant level are first used in the main plant of the combine.

The subsequent utilization of the project for all (machine construction) operations of the combine by the regional organizational and computational centers then takes place in the second stage. Here the projected solutions are adapted to specific conditions in the individual operations which result from their production program and their production organization. The planning with respect to division of labor by all organizational and computational centers of the combine in the first stage of preparation for the use of ESER computers deals not only with the effects on economizing and optimal utilization of the available planning facilities in the combine, but also at the same time with a well-timed, practice-orientated qualification of all organizational and computational centers for the new computer technology.

## 6. METHODOLOGY AND ORGANIZATION OF THE PREPARATION PERIOD

The preparation for the application of electronic data processing with respect to the division of labor is performed on



the basis of a uniform methodology in the combine. This methodology was derived from the R 300 experience, state regulations, and the methodology of the Robotron Combine VEB, and was introduced obligatorially under the orders of the General Director in the form of a system of principles. Only one keypoint of this methodology will be discussed in detail here.

Work and research partnerships (WRP) are the basis for the preparation for computer application. A WRP is assigned to each electronic data processing complex. These WRP's consist of the department leaders and group leaders most important to the project and a special electronic data processing organizer for the area for which this project is being developed primarily. Furthermore, the group leader and the topic leaders of the groups in the organizational and computational center concerned with planning are members of the WRP. The WRP is led by the combine departmental director of the appropriate department (project user). In addition, he is advised<sup>in his decisions</sup> by the electronic data processing organizer of his department and by the appropriate group leader in the organizational and computational center. The specific work for a project<sup>and</sup> the search for organizational solutions takes place in small working groups within the WRP. The solutions worked out in the groups are discussed and decided upon within the framework of the entire WRP. In each case the planning basis is a planning order of the departmental director (WRP leader) to the organizational and computational center.

The planning order must be confirmed by the general director. The WRP leaders are appointed by the general director for this purpose.

The coordination between the individual WRP's is carried out through coordination discussions of the WRP leaders under the direction of the director for organization and data processing.

This working principle has already been tried out in the preparation for the use of the R 300 and also is valid for the ESER preparation. It ensures a subject and problem oriented planning and organizationally standardized solutions in the entire combine. The principle of division of responsibility for subject-specific problems as practiced here on the one hand and the data processing technology solutions on the other have advantageous effects on the efficiency of the projects as well as on their success in routine operation.

#### 7. COMPETITION AND ECONOMIC ACCOUNTING IN THE ORGANIZATIONAL AND COMPUTATIONAL CENTERS

All R 300 organizational and computational centers and C 8205 computer centers of the combine are involved in the central performance comparison of the Ministry for Machine Tool and Fabricating Machine Construction. The following placing in the annual evaluation was obtained:

R 300

1972: 2nd place - VEB BFW Berlin

1973: 1st place - VEB Modul Karl-Marx-Stadt

C 8205

1972: 1st place - VEB Schleifkörper-Union Dresden

1973: 1st place - VEB Schleifkörper-Union Dresden.

The good results in this performance comparison lead to the conclusion that the introduction of data processing units was carried out with a fundamentally correct concept of planning and methodology. A high, productive operating time of the units and the areas of application (projects) alone, however, do not justify the above-mentioned conclusion. A further essential criterion is the contribution of the use of electronic data processing to the economic efficiency of the operation and to a qualitative improvement or more economical development of the planning, direction, and organization of the reproduction process. A planning and accounting system for the organizational and computational centers was developed in order to influence the efficiency of the use of electronic data processing as a whole and to be able to stimulate competition inside the combine. The planning and accounting of the organizational and computational centers in the Berlin "7th of October" Machine Tool Combine VEB was regulated uniformly according to the decision of the Council of Ministers of 1 March 1972 on the basic direction of electronic data processing, the pertinent planning rules, and the principles of economic calculation.

The system is based on the following categories:

- cost planning and accounting according to cost accounts and types of accounts,
  - net profits from the performances achieved for the operation and a third party,
  - consideration of economy (profit-loss calculation),
  - labor used,
  - use of equipment (hours per month) divided according to time of use,
  - specification of project development<sup>broken down</sup> according to test and routine operation as well as time sharing for the different for the different utilization complexes, and
- economic stimulation of the fulfillment of the "productive operating time" planning order.

The competition within the combine is organized on the basis of this system of planning and accounting. This is carried out with the primary goals of:

- surpassing the planned productive operating time,
- reducing the down time,
- cost reduction, and
- saving resources.

## 8. FINAL REMARKS

The development of the application of electronic data pro-



cessing into an economically significant industrial combine from 1956 up to the 25th anniversary of the GDR as presented here is the reason for our evaluation of the results and experience.

1. Electronic data processing provides new and improved resources for guiding socialistic competition and planning discussions for the workers in our plants.

2. The planning, direction, and accounting involved in production, and the material and technical provisions for these processes, were correctly chosen as the crucial factors in the application of electronic data processing. The usual balancing of production, increased continuity in materials preparation, and more rapid reaction to operational problems in planning, ~~were~~ being regular components of the complex economization and intensification, were prerequisites for the necessary increases in production and exports in recent years.

3. A number of complicated processes in management and planning today can not be performed manually at all, or can only be performed at an unconsonably high cost. This process is continued as the production process becomes more involved. The use of electronic data processing and economic and mathematical models is thus an absolute requirement in many cases.

4. The desired elimination of numerous routine operations in different fields has begun.

5. It was possible to make significant improvements in the quality of the preparation of decisions on different management levels by means of the preparation of improved auxiliary material.

6. The state of automation reached in the areas of research and development, technology and economization, corresponds to the actual potentialities of the equipment technology and system data. However, it still can not be considered to be sufficient and must be further developed under the conditions of ESER technology.

7. An essential prerequisite for the qualitative and quantitative results obtained in the use of electronic data processing was the integration of the electronic data processing projects with the use of VOPS and SOPS and their general organization for the purposes of the reproduction process. The extent of the integration is to be increased in the course of the further development and to be directed toward the realization of the ASU concept.

8. A higher efficiency of electronic data processing projects for the users was begun by linking together different

economization methods.

9. The prerequisites for economical data processing planning created with the formation of the combine, such as planning with division of labor, uniform planning concepts, and reutilization, could be met only partially with the use of the R 300 (because of time restrictions) and will be applied more extensively and purposefully in the future.

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